NASA Langley Research Center's Atmospheric Science Research Program

Langley Research Center (LaRC) has been engaged in atmospheric science research since its beginnings, first to understand the "fluid" in which aircraft fly, then during the 60's, expanding into studies to develop a better understanding of our global ecosystem "to allow intelligent decision-making for sustaining quality of life"

Since the 60's LaRC's program continues to make significant contributions to the understanding of:

1. Stratospheric Ozone (Chemistry)

- First global measurements of water vapor and key nitrogen species that modulate ozone; revealed relative role of transport vs. chemistry (LIMS, 1978 launch)
- First global measurements of key species confirming the anthropogenic source of chlorine in the stratosphere; defined trends in the stratospheric chlorine budget and **verified impact of anthropogenic emissions on global atmospheric chemistry and effectiveness of Montreal Protocol** (HALOE)
- Discovery of Polar Stratospheric Clouds (PSCs) which were later determined to have a key role in polar ozone depletion (SAM II, 1978 launch)
- Defined secular trend in ozone over past two decades (SAGE I-II, 1979 & 1985 launches)
- Simulation of full interactions of energy transfer, chemical, and dynamical processes that determine ozone distribution; simulation of ozone hole formation; assessment of impact of aircraft on ozone layer (global atmospheric modeling)

2. Earth's Energy Balance (Climate)

- Provided the first definitive global measurements of the effects of clouds on the Earth's planetary energy balance (ERBE, 1985 launch)
- Provided the definitive global measurements of the effect of the huge 1991 Mt. Pinatubo volcano on the Earth's climate (SAGE II, 1985 launch)
- Determined, for the first time, the impact of contrails on the Earth's climate a part of the NASA subsonic aircraft assessment project
- CERES (1999 launch)
- PICASSO (2003 launch) will provide critical measurements of aerosol and cloud properties that will significantly reduce uncertainties in predicting climate change
- GIFTS (2004 launch) will provide high resolution measurements of temperature, humidity and winds that will result in a significant improvement in short-term weather predictions

3. Chemistry of the Global Troposphere

- Provided an extensive data set, through airborne field expeditions, to understand the oxidizing capacity of the troposphere and assess the impact of industrial pollution on tropospheric air quality
- Assessed the impact of biomass burning in diverse ecosystems on the composition and chemistry of the local, regional and global troposphere

LaRC Atmospheric Science Home Page: http://asd-www.larc.nasa.gov/